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3. Does the landowner have an approved state or federal conservation agreement, per **WAC 222-12-041** that addresses aquatic resources?

If yes.....landowner may implement the provisions of the agreement (e.g. HCP) in place of the RMZ rules provided that the landowner has submitted a list to the department of specific rules replaced by the state or federal conservation agreement and the department has reviewed and confirmed the list.

If no.....go to 4

4. Will any harvest take place within 300 feet of the bank of any Type S or F Waters? (See * below) (See **WAC 222-16-030** for water typing definition.)

If yes - go to 6.

If no - go to 5.

5. Are there any Type Np or Ns (perennial or seasonal non-fish habitat) Waters within 100 feet of the harvest unit? (See **WAC 222-16-030** for water typing definition.)

If yes - refer to WAC 222-30-021(2), Western Washington protection for Type Np and Ns Waters or WAC 222-30-022(2) Eastern Washington protection for Type Np and Ns Waters.

If no - RMZ rules do not apply. (See * below.)

6. If the harvest unit is located in Western Washington: refer to Part 2 Implementing RMZ rule in Western Washington. (See **WAC 222-16-010** for definition of Western Washington.)

If the harvest unit is located in Eastern Washington: refer to Part 3 Implementing RMZ rule in Eastern Washington. (See **WAC 222-16-010** for definition of Eastern Washington.)

*Unless the department determines that, the channel migration zone for the type S or F water expands the RMZ beyond 300 feet from the waters edge. **Refer to Board Manual Section 2** for more details.

PART 2. IMPLEMENTING WESTERN WASHINGTON RMZ RULES

Note: Shade requirements apply within the first 75 feet from the outer edge of bankfull width (BFW) or channel migration zone (CMZ), whichever is greater, in addition to the RMZ rules. See **WAC 222-30-040** and **Board Manual, Section 1 and Section 2.**

A. Preliminary RMZ Stand Evaluation

This preliminary RMZ stand evaluation process was designed to provide a quick and simple technique for sampling a RMZ to see if there is sufficient surplus basal area to warrant the effort required to complete the field design and data collection, required in B below, for harvesting conifer within the inner zone of a RMZ.

Where an existing RMZ inner zone stand contains over 50 conifer trees 12" or larger per acre, a preliminary analysis of the core and inner zone may be conducted to determine if timber harvesting may be allowed under the rules. The preliminary analysis is conducted by taking sample plots to measure stand data and using the screening tables in Appendix F and G to see if timber harvesting may be allowed under the rules. Note that although the preliminary analysis may indicate that timber harvest is possible, the actual approval of a

harvest operation must be made by using the more intensive method in B below. To use the following screening tool, place sample plots within an area that runs 100 feet along the edge of the stream and out from the outer edge of BFW or CMZ as determined by site class using the following table.

Site Class	Distance in feet from stream to outer edge of sample plot ¹
I	150
II	130
III	100
IV	80
V	70

¹Based on a linear 100-foot plot and using class distance.

For example, a Site Class II would be 100' x 130'

Using the appropriate plot size determined from the chart above:

1. Collect stand data called for in Appendix D on one or more plots of the appropriate size.
2. Compute the average basal area (see Appendix D), % conifer, and trees per acre for the sample plots. A Riparian Data Collection Form is provided in Appendix E (experienced timber cruisers may want to use a variable plot technique to estimate basal area).
3. Using the appropriate Screening Table from Appendix G for the species, age, and site. Compare the computed average basal area per acre from your plots to the screening table value.
4. If the average basal area per acre is larger than the table value, then a complete RMZ analysis and harvest option evaluation harvest may be allowed. Refer to B. RMZ Stand Analysis and Harvest Option Evaluation for Western Washington below.
5. If the average basal area per acre is smaller than the table value, then harvest may not be allowed within the inner zone. **Note:** This is only a preliminary screen and only a complete analysis can truly verify no harvest opportunities. This does not preclude hardwood conversion per **WAC 222-30-021 (1)(b)(i)**.

B. RMZ Stand Analyses And Harvest Option Evaluation For Western Washington

DFC target basal area. The objective of riparian management zones is to retain or improve riparian forest conditions as needed to provide for fish habitat and water quality. If management is conducted in the RMZ, it must be consistent with desired future condition (DFC) target basal area. DFC targets will be used as the performance measure for all riparian stand manipulation. Riparian prescriptions are dependent on site productivity, stand composition (percent conifer, trees per acre and basal area per acre) and age of stand.

DFC basal area targets for mature riparian stands are set by site class.

Site Class	SPTH	DFC Target BA/AC (at 140 years)
I	200 feet	285
II	170 feet	275
III	140 feet	258
IV	110 feet	224
V	90 feet	190

Stand Requirements

Growth modeling has established the growth trajectory (pathways) of riparian stands that will likely yield DFC stand characteristics at the target age. Any point along the trajectory can be identified as the Stand Requirements for management of a stand at that age. Growth has been modeled using ORGANON with the variables of site, age, trees per acre, basal area per acre, and presence of conifer. The modeling results are incorporated into the computer program that has been developed to do the DFC stand analysis. See “Procedures for completing stand analysis and harvest option evaluation” below.

Harvest in the RMZ must be conducted in such a way as to meet or exceed Stand Requirements. If the current stand, in the combined core zone and inner zone, does not meet Stand Requirements, no harvest is allowed in the inner zone.

If the current stand, in the combined core zone and inner zone, contains more than sufficient trees to meet Stand requirements, two harvest options are available to landowners.

Option 1 Thinning from below

The objective of thinning is to distribute Stand Requirement trees in such a way as to shorten the time required to meet large wood recruitment for fish habitat and water quality needs. This is achieved by increasing the potential for leave trees to grow larger than they otherwise would without thinning.

Option 1 Requirements

1. Post thinning stand conditions must meet or exceed the Stand Requirements (basal area) targets.
2. Thinning must be from below (harvest the smaller trees) leaving the largest trees.
3. Thinning cannot decrease the proportion of conifer in the stand (See Appendix F).
4. Shade retention to meet the shade rule must be confirmed for any harvest within 75 feet of the outer edge of the BFW or CMZ, whichever is greater.
5. Thinning may not reduce the number of residual trees in the inner zone less than 57 trees per acre.

Option 1 Thinning from below, zone width requirements

Site class	RMZ width	Core zone width (measured from the outer edge of bankfull width or CMZ)	Inner zone width (measured from outer edge of core zone)		Outer zone width (measured from outer edge of inner zone)	
			stream width ≤10'	stream width >10'	stream width ≤10'	stream width >10'
I	200'	50'	83'	100'	67'	50'
II	170'	50'	63'	78'	57'	42'
III	140'	50'	43'	55'	47'	35'
IV	110'	50'	23'	33'	37'	27'
V	90'	50'	10'	18'	30'	22'

Option 2 Leaving trees closest to water

The objective of Option 2 harvest is to maximize riparian forest function by retaining the Stand Requirement trees necessary to achieve desired future condition (DFC) in a position as close to the stream as possible. The underlying assumption is that individual trees growing closer to the stream provide proportionally more functional benefit than trees farther away from the stream.

Option 2 Requirements

1. Applies only to site class I, II, and III for streams less than or equal to 10 feet wide and to site class I and II for streams greater than 10 feet wide. (On lower site classes, the Option 2 “floors” or minimum buffer widths equal or exceed the required inner zone width resulting in no opportunity to apply Option 2 on these lower productivity sites. Option 1 harvest is not subject to the “floors”.)
2. Harvest is not permitted within 30 feet of the core zone for streams less than or equal to 10 feet wide and harvest is not permitted within 50 feet of the core zone for streams greater than 10 feet wide. If this results in surplus basal area per stand requirements, the landowner may take credit for the surplus by harvesting additional riparian leave trees required to be left in the adjacent outer zone on a basal area-for-basal area basis, provided the number of leave trees in the outer zone is not reduced below 10 trees per acre.
3. Residual leave trees in the combined core and inner zone must meet stand requirements;
4. A minimum of 20 riparian leave trees greater than 12 inches per acre will be retained in any portion of the inner zone where harvest occurs. These trees will not be counted or considered towards meeting the applicable stand requirements nor can the number be reduced below 20 for any reason;
5. Trees are selected for harvest starting from the outer most portion of the inner zone first then progressively closer to the stream;

Option 2. Leaving trees closest to water, zone width requirements

Site class	RMZ width	Core zone width (measured from outer edge of the bankfull width or CMZ of water)	Inner zone width				Outer zone width measured from outer edge of inner zone	
			stream width ≤10' (measured from outer edge of core zone)	stream width ≤10' minimum floor distance (measured from outer edge of core zone)	stream width >10' (measured from outer edge of core zone)	stream width >10' minimum floor distance (measured from outer edge of core zone)	stream width ≤10'	stream width >10'
I	200'	50'	84'	30'	84'	50'	66'	66'
II	170'	50'	64'	30'	70'	50'	56'	50'
III	140'	50'	44'	30'	**	**	46'	**

** Option 2 for site class III on streams > 10' is not available.

Procedures for completing stand analysis and harvest option evaluation

A computer program designed specifically for stand analyses is required in order to evaluate the chosen harvest option within any Type S or F Water RMZ for Western Washington. Contact any DNR region office for access to this program or access at <http://www.wa.gov/dnr>. The computer capacity required for utilizing this program is a **Windows '95** or better operating system and at least 5 MB free disk space.

1. The following steps are necessary to complete the stand analysis:
2. The core zone and inner zone widths must be identified on the ground for the appropriate stream size and site class. See charts above, refer to Appendix A Determining Site Class, and refer to Board Manual Section 2.
3. A 100% stem tally of the core and inner zone is required by 2" diameter classes, distinguishing number of conifer trees from hardwood trees by zone for the Option 1 zone widths. (Option 1 zone widths are used in the analysis because they are the widest zones of the two harvest options.) Doing the analysis on the widest possible zone preserves the later choice of either Option 1 or Option 2 harvest See Appendix E Riparian Data Collection Form.
4. Determine Stand Age. See Appendix C Determining Stand Age.
From the previous steps, the following data must be collected to use the program:
 - stream; determine whether bankfull width is, ≤ 10 feet or > 10 feet
 - site class (see Appendix A)

- length of RMZ in feet
 - stand age (see Appendix C)
 - core zone conifer and hardwood trees categorized by 2" diameter class
 - inner zone conifer and hardwood categorized trees by 2" diameter class
5. Enter field data into RMZ analysis program.
 6. Review Option 1 and Option 2 prescriptions computed.
 - Option 1 allows you to select trees for removal by using the harvest criteria previously mentioned in Option 1. The program will evaluate the impact your selections will have on the required basal area and minimum leave tree requirements. Field verification of your selections may be necessary to evaluate the operational practicality of your decision.
 - Option 2 will provide a minimum leave tree and harvest zone if harvest is allowed.
 7. After you have made a selection of your harvest option that you will be implementing, a paper copy of the DFC summary page (select "print" from the pull down menu) created from the program must be included with the forest practice application submitted to the DNR.

PART 3. IMPLEMENTING EASTERN WASHINGTON RMZ RULES

Note: Shade requirements apply within the first 75 feet from the outer edge of the BFW or CMZ, which ever is greater, in addition to the RMZ rules. See **WAC 222-30-040** and **Board Manual, Section 1 and Section 2.**

Ponderosa Pine and Mixed Conifer Habitat Types

The width of the inner and outer zones for these two timber types is based on site class and stream size. Use Appendix A, Determining Site Class and Appendix B, Determining the Widths of RMZ.

The number of leave trees and required basal areas for the inner zone vary for these two timber types. Use Appendix C, Determining Stand Age; Appendix D, Determining Basal Area; Appendix H, Eastern Washington Stand Evaluation Sheet for Ponderosa Pine and Mixed Conifer; and Appendix I, Eastern Washington Field Guide: Leave Tree Tables.

High Elevation Timber Type

Width requirements of the inner and outer zones of this timber type are based on stream size and site class. Determine the zone widths from the eastern Washington RMZ width tables in **WAC 222-30-022.**

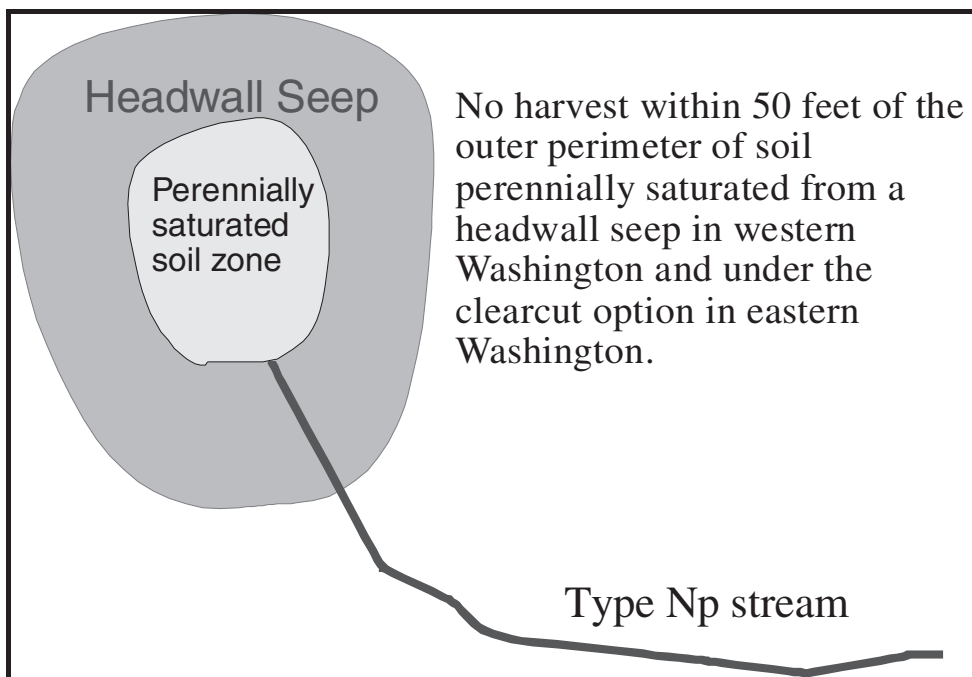
Leave trees requirements in the inner zones of this timber type are determined by following the Stand Requirements in Part 2. Implementing Western Washington RMZ Rules.

PART 4. IDENTIFYING SENSITIVE SITES ALONG TYPE NP WATERS IN WESTERN AND EASTERN WASHINGTON

Sensitive sites provide important habitats and functions for aquatic resources. Aquatic resources include water quality, fish, and six species of amphibians (Columbia torrent salamander, Cascade torrent salamander, Olympic torrent salamander, Dunn's salamander, Van Dyke's salamander, and the tailed frog). Sensitive sites have been incorporated into the forest practices rules to protect these areas from forestry related activities. Sensitive sites are areas near or adjacent to Type Np Water, and include headwall seeps, side-slope seeps, headwater springs, Type Np intersections, and alluvial fans (WAC 222-16-010).

Headwall Seeps

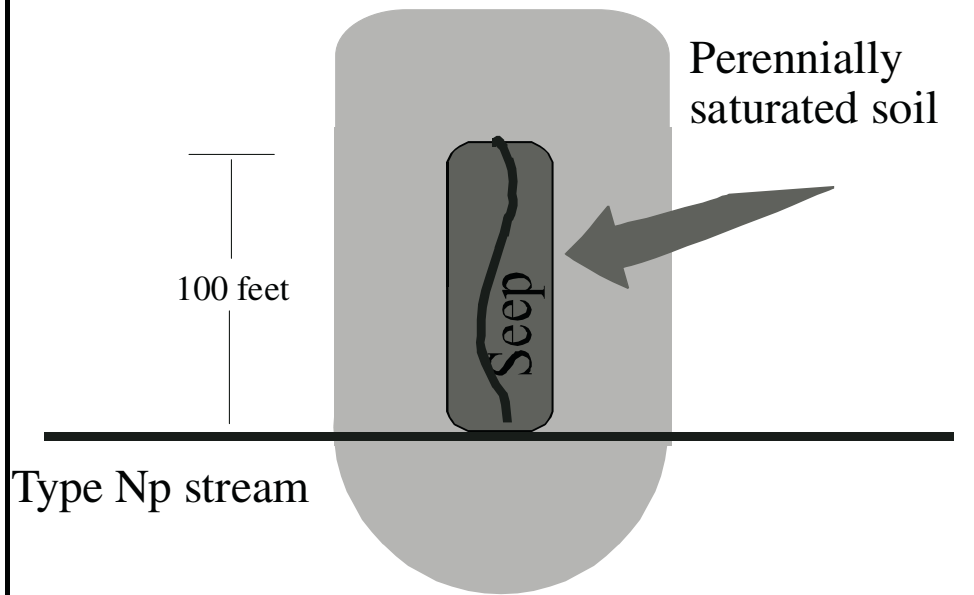
Headwall seeps are wetted areas located at the base of cliffs or other steep areas, and are found at the head of Type Np Waters when present. Headwall seeps connect to the stream channel via overland flow, and are often characterized by loose substrate or fractured bedrock. Water occurs at or near the surface of headwall seeps year-round. Headwall seeps that are associated with the spray from falling water may be especially important to amphibians. The vegetation communities that are associated with headwall seeps are similar to that of wetlands, and may contain some or all of the following taxa: sedges, rushes, horsetails, willows, devils club, salmonberry, skunk cabbage, piggyback plant, lady fern, leafy liverwort, black cottonwood, Oregon ash, or red alder. Headwall seeps may have tree canopy gaps that may be visible from aerial photos, although the presence or absence of seeps must be confirmed using ground-based observation. Timber harvest is prohibited within 50 feet of perennially saturated soils associated with headwall seeps in Western Washington and under the clear-cut option in Eastern Washington. For more information on NP Water, see **Section 23.**



Side-slope Seeps

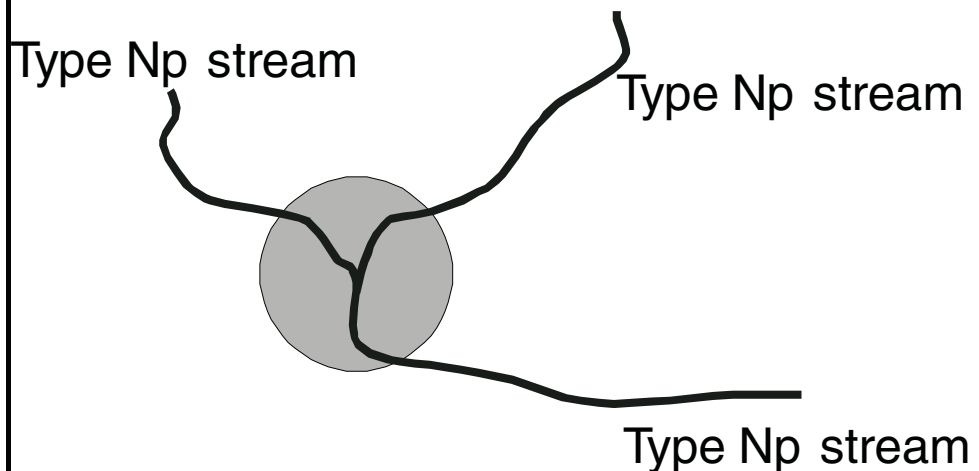
Side-slope seeps are wetted areas adjacent to Type Np Waters. For the purposes of the Forest Practices rules, and where present, they originate within 100 feet of the stream channel and flow without a defined channel. Side-slope seeps exist where valley slopes exceed 20%. Like headwall seeps, side-slope seeps may be characterized by loose substrate or fractured bedrock with water present at or near the surface year-round. Delivery of water from side-slope seeps to the stream channel is visible by someone standing at or near the stream. Side-slope seeps that are associated with the spray from falling water may be especially important to amphibians. The vegetation communities that are associated with headwall seeps are similar to that of wetlands, and may contain some or all of the following taxa: sedges, rushes, horsetails, willows, devils club, salmonberry, skunk cabbage, piggyback plant, lady fern, leafy liverwort, black cottonwood, Oregon ash, or red alder. Side-slope seeps may have tree canopy gaps that may be visible from aerial photos, although the presence or absence of seeps must be confirmed using ground-based observation. Timber harvest is not allowed within 50 feet of the perennially saturated soil of a side-slope seep in western Washington and under the clear-cut option in eastern Washington.

Side-slope seeps out to 100' receive a 50' buffer around the perennially saturated soil zone.



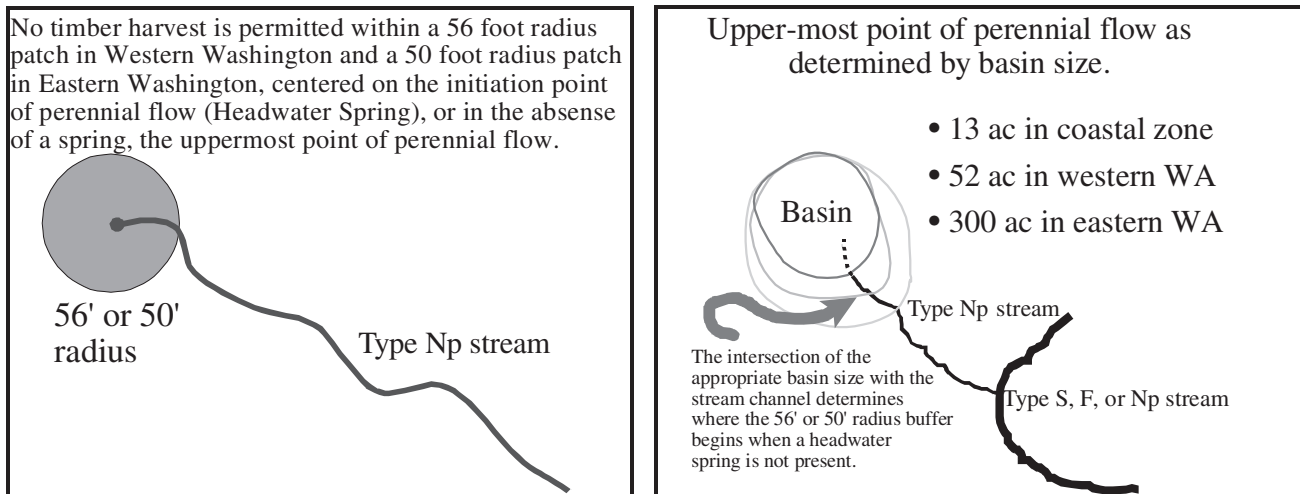
Type Np intersections occur where two Type Np streams join.

No timber harvest is permitted within a 56 foot radius in Western Washington and a 50 foot radius in Eastern Washington, centered on the intersection of 2 or more type Np streams.

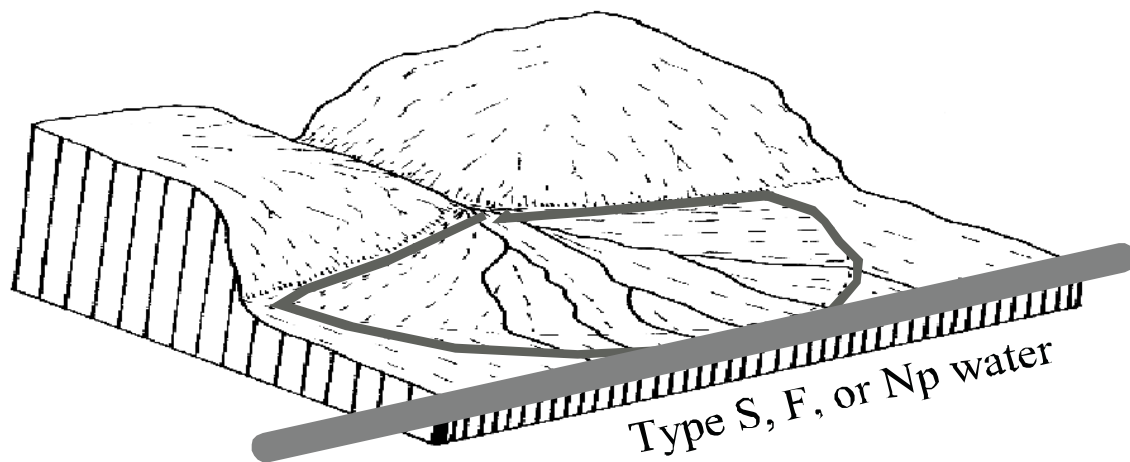


Headwater Springs

Headwater springs (**WAC 222-16-010**) are permanent springs that are located at the head of perennial channels where present and form the upper extent of an Np Water. For further identification of an Np Water, see **WACs 222-16-030** and **222-16-031**. When these springs are present, they provide especially important amphibian habitat. During low flow periods, they are often observed as an abrupt small pool or riffle with flow where the channel is immediately and persistently dry above. Vegetation characteristics may not differ markedly from the taxa up- and down-stream. However, vegetation similar to that of headwall seeps or side-slope seeps may be present. For management purposes, the upper-most extent of perennial flow is protected as a sensitive site, and must be protected with a 56-foot radius buffer in Western Washington and a 50-foot radius buffer in Eastern Washington (see section 23 of the Board Manual for further description on identifying headwater springs.).



Alluvial fans occur where a torrent of debris and/or sediment has migrated down a channel length and abruptly stopped at the junction with another channel. Alluvial fans formed during recent climactic regimes are notably prone to erosion when disturbance, such as road construction or timber harvest, occur on them. Timber harvest is not allowed on alluvial fans.



APPENDIX FOR SECTION 7

The following appendices contain forms, tables, and tools to help implement the forest practices riparian management zone (RMZ) rules.

Appendix A Determining Site Class

For the purposes of determining the inner zone and outer zone widths, the site class for all operations is the site index reported in the Washington State Department of Natural Resources (DNR) State Soil Survey. This reflects a 50-year site index for Western Washington and a 100-year site index for Eastern Washington. Site class maps have already been developed by the DNR. Contact a DNR region office for site class maps and/or State Soil Survey information.

1. Using the DNR site class map that corresponds to the location of the operation, determine the site classes that are within 200 horizontal feet of the BFW or CMZ, which ever is greater, for all Type S and F Waters within the operation.
 - If there is more than one site class adjacent to the stream within a proposed RMZ, the landowner has the option of using the highest site class (i.e. most protective) or segmenting out the site classes and managing them separately. If managed separately, complete a stand analysis for each site class.
 - If the site index in the soil survey is for red alder, and the whole RMZ width is within that site index, use site class V. If the red alder site index is for only a portion of the RMZ width, or if there is on-site evidence that the site has historically supported conifer, use the site class for conifer in the most physiographically similar adjacent soil polygon. A physiographically similar area is one that has characteristics that most closely resembles the proposed activity area. Examples of characteristics to compare by are: soil composition, topography, vegetative species composition, and tree stand characteristics.
 - In Western Washington, if no site index is reported in the soil survey and no other data is available, use the site class for conifer in the most physiographically similar adjacent soil polygon. In Eastern Washington, if no site index is reported in the soil survey assume site class III, unless site-specific information indicates otherwise. Consultation with a DNR region office or a local county planning office may help in discovering relevant soils and site class information.
 - If the site index is non-commercial or marginally commercial, use site class V.

Appendix B Determining the Widths for an RMZ

1. **Determine site class:** See Appendix A
2. **Determine stream size:** Western Washington either ≤ 10 feet wide or > 10 feet wide
Eastern Washington either ≤ 15 feet wide or > 15 feet wide
3. **Identify BFW or CMZ:** Refer to Board Manual Section 2.
4. **Using the above information:** Refer to the appropriate RMZ width tables below.

No inner zone management RMZ widths for Western Washington (No Harvest in the Inner Zone Option)

Site class	RMZ width	Core zone width (measured from outer edge of the bankfull width or CMZ, whichever is greater)	Inner zone width (measured from outer edge of core zone)		Outer zone width (measured from outer edge of inner zone)	
			stream width $\leq 10'$	stream width $> 10'$	stream width $\leq 10'$	stream width $> 10'$
I	200'	50'	83'	100'	67'	50'
II	170'	50'	63'	78'	57'	42'
III	140'	50'	43'	55'	47'	35'
IV	110'	50'	23'	33'	37'	27'
V	90'	50'	10'	18'	30'	22'

Eastern Washington RMZ for streams less than or equal to 15 feet wide.

Site Class	Total RMZ Width	Core Zone Width (measured from outer edge of the bankfull width or CMZ, whichever is greater)	Inner Zone Width	Outer Zone Width
I	130'	30'	45'	55'
II	110'	30'	45'	35'
III	90'	30'	45'	15'
IV	75'	30'	45'	0
V	75'	30'	45'	0

Eastern Washington RMZs for streams greater than 15 feet wide.

Site Class	Total RMZ width	Core Zone Width (from outer edge of the bankfull width or CMZ, whichever is greater)	Inner Zone Width	Outer Zone Width
I	130'	30'	70'	30'
II	110'	30'	70'	10'
III	100'	30'	70'	0
IV	100'	30'	70'	0
V	100'	30'	70'	0

Appendix C Determining Stand Age

Stand age (average age of dominate conifer trees) is needed for the purposes of evaluating the management options within the Riparian Management Zone. Stand age can be determined from landowner inventory or stand history information, if available. Otherwise stand age is determined from increment boring of an average of the dominant conifer trees within the riparian zone. Increment boring should be made at 4.5 feet above the ground (b.h. - breast height) on the uphill side of the tree with 5 years added to the growth ring count to account for growth up to boring height.

Appendix D Determining Basal Area

Determining the basal area is essential to evaluating the management options available within a inner riparian management zone. Basal area means the area in square feet of the cross section of a tree bole measured at 4.5 feet above the ground on the uphill side of the tree.

1. Measure diameter breast height (d.b.h.) of all trees within the core and inner zone of the riparian management zones. Recording the number of conifer trees and hardwood trees by d.b.h. in 2 inch increments (e.g. trees from 5" to 6.9" are tallied in the 6" diameter class, trees 7" to 8.9" are tallied in the 8" diameter class, etc.) Note: tree diameters are typically measured using either a diameter tape or Biltmore stick.
2. Sum the number of trees by type (conifer vs. hardwood) for each d.b.h. class.
3. Multiply the sum of tree per d.b.h. class by the basal area for that particular diameter class. Approximate basal area can be calculated by multiplying (D.B.H.)(D.B.H.) x .00545. Example if D.B.H. equals 16": (16)(16) x .00545 = 1.395 sq. ft.
4. Sum all the basal areas of all the diameter classes by type (conifer vs. hardwood) and by zone (core vs. inner zone).

5. Total basal area per acre can be determined by dividing the square foot area of cruised site by 43,560 sq. ft. (area of an acre) to determine acreage and then dividing the total basal area by the acreage. Example: 100' width x 1200' length = 120,000 sq. ft. / 43,560 sq ft = 2.75 acres. BA total is 350. $350 \text{ BA} / 2.75 = 127.3 \text{ BA/ac}$. **Note: A program has been developed to compute step 3, 4, & 5. However, preliminary analysis procedures will require manual computations.**

Appendix E Western Washington Riparian Data Collection Form

Unit name: _____ Legal description: _____

Prepared by: _____ Date: _____

RIPARIAN CRUISE FORM

CORE ZONE

INNER ZONE

D.B.H.	BA	CONF. #TREES	HWD #TREES	TOTAL# TREES	TOTAL BA	CONF. #TREES	HWD #TREES	TOTAL #TREES	TOTAL BA
6	.20								
8	.35								
10	.55								
12	.79								
14	1.1								
16	1.4								
18	1.8								
20	2.2								
22	2.6								
24	3.1								
26	3.7								
28	4.3								
30	4.9								
32	5.6								
34	6.3								
36	7.1								
38	7.9								
40	8.7								
42	9.6								
44	10.6								
46	11.5								
48	12.6								
50	13.6								
52	14.8								
54	15.9								
56	17.1								
58	18.3								
60	19.6								
Total									

site class _____. Stand age _____. % conifer _____. Trees / acre _____. BA/ac _____.

Total BA/ac = (total plot BA) / (length of plot x width of plot in feet) / 43,560 feet

TPA (trees per acre) = (total # of plot trees) / (length of plot x width of plot in feet) / 43,560 ft² (area of an acre)

Appendix F Western Washington - Determining % Conifer Basal Area

The stand species composition within the Riparian Management Zone is necessary information for evaluating harvest options in the RMZ. For Western Washington riparian management zones, the stand composition will be expressed in conifer basal area as a percent of total basal area.

1. To determine the % conifer basal area, the total basal area (sum of the total conifer and total hardwood basal area) is divided into the total conifer basal area multiplied by 100 and expressed as percent conifer.

Example:

total conifer BA of 159 + total hardwood BA of 82 = Total BA 240

$(\text{total conifer BA } 159 / \text{Total BA } 240) \times 100\% = 66\% \text{ conifer}$

Appendix G Western Washington Preliminary Riparian Management Zone Screening Stand Tables

Use the table with the age category that is the closest to the stand age being considered.

Douglas Fir		Site I		Age 35		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	NA	NA	NA	NA
40	NA	NA	NA	NA	NA	NA
50	NA	NA	336	358	380	404
60	NA	166	112	49	48	48
70	129	64	49	48	47	47
80	69	49	48	47	47	46
90	49	47	46	46	46	46
100	46	46	46	46	46	46

Douglas Fir		Site I		Age 45		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	NA	NA	NA	NA
40	NA	NA	NA	NA	NA	NA
50	NA	NA	445	531	NA	NA
60	NA	247	262	276	290	305
70	NA	162	145	128	113	100
80	127	97	77	64	56	51
90	80	62	54	50	50	49
100	53	50	49	49	49	49

Douglas Fir		Site I		Age 55		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	NA	NA	NA	NA
40	NA	NA	NA	NA	NA	NA
50	NA	NA	429	512	595	NA
60	NA	268	295	322	349	377
70	NA	204	205	206	207	208
80	NA	150	138	128	119	112
90	118	103	92	85	80	76
100	84	74	69	66	64	63

Douglas Fir		Site I		Age 65		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	NA	NA	NA	NA
40	NA	NA	NA	NA	NA	NA
50	NA	NA	NA	588	NA	NA
60	NA	NA	373	426	479	533
70	NA	262	285	308	332	356
80	NA	211	216	221	227	232
90	NA	161	154	148	142	136
100	129	116	105	97	91	86

Douglas Fir		Site II		Age 35		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	NA	NA	NA	NA
40	NA	NA	NA	581	NA	NA
50	NA	249	213	175	133	68
60	NA	126	61	49	48	47
70	125	56	48	47	46	46
80	71	48	46	45	45	44
90	49	46	45	44	44	44
100	46	44	44	43	43	43

Douglas Fir		Site II		Age 45		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	NA	NA	NA	NA
40	NA	NA	NA	NA	NA	NA
50	NA	306	317	328	338	348
60	NA	204	179	156	137	121
70	NA	128	95	75	63	56
80	122	79	59	50	49	49
90	79	54	49	48	48	48
100	56	48	47	47	47	46

Douglas Fir		Site II		Age 55		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	NA	NA	NA	NA
40	NA	NA	NA	NA	NA	NA
50	NA	NA	355	374	392	409
60	NA	237	225	214	206	198
70	NA	172	150	133	121	112
80	156	123	102	90	82	76
90	115	87	74	67	63	61
100	84	67	60	57	55	54

Douglas Fir		Site II		Age 65		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	NA	NA	NA	NA
40	NA	NA	NA	NA	NA	NA
50	NA	NA	402	456	510	563
60	NA	284	304	322	340	357
70	NA	226	226	225	224	224
80	NA	176	166	157	151	146
90	150	131	120	112	107	10
100	113	98	91	86	84	82

Douglas Fir		Site III		Age 35		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	NA	NA	NA	NA
40	NA	NA	380	402	423	444
50	NA	191	144	110	88	74
60	NA	102	64	50	49	48
70	115	55	48	47	46	45
80	71	48	46	45	44	43
90	49	45	44	43	42	42
100	45	42	42	41	41	41

Douglas Fir		Site III		Age 45		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	NA	NA	NA	NA
40	NA	NA	439	483	526	568
50	NA	253	234	218	205	194
60	NA	168	133	109	94	84
70	NA	105	77	63	56	52
80	116	68	52	49	48	47
90	79	50	48	47	46	46
100	55	47	46	45	44	44

Douglas Fir		Site III		Age 55		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	NA	NA	NA	NA
40	NA	NA	457	501	543	585
50	NA	280	269	259	251	244
60	NA	203	176	156	141	131
70	NA	147	117	99	88	81
80	149	104	82	71	64	61
90	113	76	61	55	51	50
100	84	59	51	49	49	48

Douglas Fir		Site III		Age 65		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	NA	NA	NA	NA
40	NA	NA	NA	559	NA	NA
50	NA	NA	349	371	391	410
60	NA	253	250	247	244	242
70	NA	197	181	169	159	152
80	NA	151	131	118	109	103
90	144	112	96	86	81	78
100	113	86	74	69	65	63

Douglas Fir		Site IV		Age 35		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	456	499	542	583
40	NA	248	226	208	194	184
50	NA	122	89	75	67	63
60	135	72	54	49	48	48
70	89	49	47	45	44	44
80	60	46	44	42	42	41
90	47	42	41	40	39	39
100	41	38	37	36	36	36

Douglas Fir		Site IV		Age 45		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	NA	566	NA	NA
40	NA	300	302	303	305	306
50	NA	179	147	128	115	107
60	NA	116	88	75	68	64
70	129	76	58	51	49	48
80	93	54	48	47	46	45
90	65	48	45	44	43	43
100	47	43	42	41	40	40

Douglas Fir		Site IV		Age 55		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	NA	574	NA	NA
40	NA	NA	329	334	339	343
50	NA	210	182	162	149	140
60	NA	149	118	102	92	86
70	NA	105	82	71	65	61
80	124	77	61	55	51	50
90	94	58	50	48	47	46
100	66	48	46	46	45	44

Douglas Fir		Site IV		Age 65		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	NA	NA	NA	NA
40	NA	NA	385	413	440	465
50	NA	261	256	251	247	244
60	NA	198	178	164	154	147
70	NA	148	125	112	104	99
80	154	111	91	82	76	72
90	122	84	70	64	61	58
100	95	65	56	52	50	49

Douglas Fir		Site V		Age 35		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	315	309	304	300
40	NA	176	145	128	119	112
50	NA	95	76	69	65	62
60	110	66	55	50	49	48
70	78	50	47	45	44	44
80	57	46	43	42	41	40
90	46	41	39	38	37	37
100	41	36	35	34	34	33

Douglas Fir		Site V		Age 45		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	374	389	403	415
40	NA	224	202	189	179	173
50	NA	133	111	101	95	91
60	144	93	77	70	66	64
70	107	68	58	53	51	50
80	81	53	48	47	46	45
90	61	47	45	43	43	42
100	47	42	41	40	39	39

Douglas Fir		Site V		Age 55		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	396	420	441	461
40	NA	252	238	227	220	214
50	NA	162	138	125	117	112
60	NA	117	97	87	82	78
70	134	87	73	66	63	61
80	104	68	58	54	51	50
90	82	55	49	48	47	46
100	60	48	46	45	44	43

Douglas Fir		Site V		Age 65		
	Trees Per Acre					
	50	100	150	200	250	300
% Conifer	Minimum Basal Area Per Acre for Inner Zone Management*					
30	NA	NA	439	481	520	557
40	NA	291	296	301	304	307
50	NA	206	191	181	174	170
60	NA	154	135	124	118	114
70	NA	116	100	92	87	84
80	128	90	78	72	69	67
90	102	72	63	59	57	55
100	81	59	53	50	49	49

Appendix H Eastern Washington Stand Evaluation Sheet for Ponderosa Pine and Mixed Conifer

Stand Evaluation Sheet

This sheet will allow for a quick assessment of the amount of timber by size and associated basal area to be used in assessment of the inner zone within Eastern Washington RMZs.

Assumed constants:

- For streams which are equal to or less than 15 feet wide 1000 feet in stream reach equals approximately 1.03 acre
- For streams of over 15 feet wide 1000 feet in stream reach equals approximately 1.61 acres.

1.0: Estimation Table: Tally number of trees per diameter class at DBH

Diameter Class	Number of Trees	Basal Area per tree	Total Basal area within diameter class [#trees X BA/tree]
32		5.6	
30		4.9	
28		4.3	
26		3.7	
24		3.1	
22		2.6	
20		2.2	
18		1.8	
16		1.4	
14		1.1	
12		.79	
10		0.55	
8		0.35	
6		0.20	

Basal area per tree is calculated from the following equation: $dbh \times dbh \times .00545$

For streams with a bankfull width of ≤ 15 feet

Total # of trees on reach [TPR] = _____

Total Reach Basal Area [RBA] = _____

Distance of reach _____ \div 1000 = _____ acres

TPR _____ \div _____ acres = _____ TPA

RBA _____ \div _____ acres = _____ BA/acre

For streams with a bankfull width of > 15 feet

Total # of trees on reach [TPR] = _____

Total Reach Basal Area [RBA] = _____

Distance of reach _____ \div 625 = _____ acres

TPR _____ \div _____ acres = _____ TPA

RBA _____ \div _____ acres = _____ BA/acre

Note: TPA = Trees per Acre

2.0: What habitat type zone does the inner zone fall into:

☐ Ponderosa Pine Upper threshold 110 ba/ac

Mixed Conifer

☐ low site index [<90] upper threshold 110 ba/ac

☐ Med. site index [90-110] upper threshold 135 ba/ac

☐ High site index [>110] upper threshold 140 ba/ac

Residual inner zone composition can be calculated if the inner zones basal area exceeds the upper basal area threshold for the site classification.

3.0: Residual Calculations

Calculate the residual inner zone requirements.

Table 3.1: 21 largest trees per acre

21 x _____ acres = trees to be left _____

[Find the number of the largest trees from the estimation table below.]

Diameter Class	Number of Trees	Basal Area per tree	Total Basal area within diameter class [#trees X BA/tree]

Total # of large trees _____

Large tree basal Area _____

Large stem calculations :

TPR _____ \div _____ acres = _____ TPA

RBA _____ \div _____ acres = _____ BA/ac.

Table 3.2: 29 Additional Tree ≥ 10 inches Calculation:

Diameter Class	Number of Trees	Basal Area per tree	Total Basal Area within diameter class [#trees X BA/tree]

Total # of Trees_____

Total Basal Area_____

TPR _____ \div _____ acres = _____ TPARBA_____ \div _____ acres = _____ BA/ac.**3.3: Total inner zone calculations:**

Minimum required basal area after harvest:

[] Ponderosa Pine Lower threshold 60 ba/ac

Mixed Conifer

[] low site index [<90] lower threshold 70 ba/ac

[] Med. site index [90-110] lower threshold 90 ba/ac

[] High site index [>110] lower threshold 110 ba/ac

To calculate total basal area take the BA from the 21 largest tree calculation and add the 29 additional tree BA calculation for total stems

_____ Table 3.1 BA/Ac + _____ 3.2 BA/Ac = _____

To calculate total stems per acre, take the TPA from the 21 largest tree calculation and add the 29 additional tree TPA calculation for total stems

_____ Table 3.1 TPA + _____ 3.2 TPA = _____ TPA

If the total stems (50 stems per acre) of 10" dbh and larger trees do not meet the baseline threshold, then the landowner has two options:

- 1] The landowner can leave more 10" and greater trees to add on more basal area
- 2] The landowner can use the basal area of the 6" and greater trees on the site to meet overall basal area requirements.

3.4 Additional calculation needs

Total # of Trees_____

Total Basal Area_____

TPR _____ ÷ _____ acres = _____ TPA

RBA_____ ÷ _____ acres = _____ BA/ac.

_____3.1BA/Ac + _____3.2 BA/Ac =_____

_____3.1TPA + _____3.2 TPA =_____ TPA

4.0 Additional requirements

- The 21 largest trees do not have to be evenly spaced.
- The 29 additional trees ≥ 10 inches should be selected based on the following priority order:
 - Trees that provide shade to water
 - Trees that lean towards the water
 - Trees of the preferred species
 - Ponderosa pine habitat type
 - All hardwoods
 - Ponderosa pine
 - Western larch
 - Douglas-fir
 - Western red cedar
 - Mixed conifer habitat type
 - All hardwoods
 - Western larch
 - Ponderosa pine
 - Western red cedar
 - Western white pine
 - Douglas-fir
 - Lodgepole pine
 - Trees that are evenly spaced across the inner zone.

Appendix I Eastern Washington Field Guide Leave - Tree Tables

FIELD GUIDE

EASTERN WASHINGTON BASAL AREA TABLES

These tables are meant to be used as default tables if no other evaluation is used. All other requirements as to leave tree requirements will meet those found in WAC 222-30-022 as well as Appendix H of this section.

Reach equivalent calculations were rounded to the nearest hundredth (0.01), tree and basal area counts were rounded to the nearest whole number. Numbers greater than or equal to 0.5 were rounded up, numbers less than or equal to 0.4 were rounded down.

A. TYPE F WATERS: Small Stream Tables 1.0 [streams less than 15 feet in bankfull width]

- Have an inner zone width of 45 feet
- 1000 feet stream reach equates to approximately 1.03 acre

Table 1a.1: Ponderosa Pine Habitat [elevations up to 2500 feet]

Length of stream	1000	900	800	700	600	500	400	300	200	100
Reach Equivalent Acre	1.03	0.93	0.82	0.72	0.62	0.52	0.41	0.31	0.21	0.10
21 Largest Trees Numbers/ reach	22	20	17	15	13	11	9	7	4	2
29 additional Trees >10"	30	27	24	21	18	15	12	9	6	3
Basal Area Baseline limit	62	56	49	43	37	31	25	19	13	6
Basal Area Upper threshold	113	102	90	79	68	57	45	34	23	11

Table 1a.2: Mixed Conifer Zone- Low site index [less than 90]

Length of stream	1000	900	800	700	600	500	400	300	200	100
Reach Equivalent Acres	1.03	0.93	0.82	0.72	0.62	0.52	0.41	0.31	0.21	0.10
21 Largest Trees Numbers/ reach	22	20	17	15	13	11	9	7	4	2
29 additional Trees >10"	30	27	24	21	18	15	12	9	6	3
Basal Area Baseline limit	72	65	57	50	43	36	29	22	15	7
Basal Area Upper threshold	113	102	90	79	68	57	45	34	23	11

Table 1a.3: Mixed Conifer Zone- Medium Site index [90-110]

Length of stream	1000	900	800	700	600	500	400	300	200	100
Reach Equivalent Acres	1.03	0.93	0.82	0.72	0.62	0.52	0.41	0.31	0.21	0.10
21 Largest Trees Numbers/ reach	22	20	17	15	13	11	9	7	4	2
29 additional Trees >10"	30	27	24	21	18	15	12	9	6	3
Basal Area Baseline limit	93	84	74	65	56	47	37	28	19	9
Basal Area Upper threshold	134	121	107	94	81	68	53	40	27	13

Table 1a.4: Mixed Conifer Zone- High site index [greater than 110]

Length of stream	1000	900	800	700	600	500	400	300	200	100
Reach Equivalent Acres	1.03	0.93	0.82	0.72	0.62	0.52	0.41	0.31	0.21	0.10
21 Largest Trees Numbers/ reach	22	20	17	15	13	11	9	7	4	2
29 additional Trees >10"	30	27	24	21	18	15	12	9	6	3
Basal Area Baseline limit	93	84	74	65	56	47	37	28	19	9
Basal Area Upper threshold	155	140	123	108	93	78	62	47	32	15

B. Type F Waters: Large Streams Tables 2.0 [streams greater than 15 feet in width]

- Have an inner zone width of 70 feet
- 1000 feet of reach equates to 1.61 acres

Table 1b.1: Ponderosa Pine Habitat [elevations up to 2500 feet]

Length of stream	1000	900	800	700	600	500	400	300	200	100
Reach Equivalent Acres	1.61	1.45	1.29	1.13	0.97	0.81	0.64	0.48	0.32	0.16
21 Largest Trees Numbers/ reach	34	30	27	24	20	17	13	10	7	3
29 additional Trees >10"	47	42	37	33	28	23	19	14	9	5
Basal Area Baseline limit	97	87	77	68	58	49	38	29	19	10
Basal Area Upper threshold	177	160	142	124	107	89	70	53	35	18

Table 1b.2: Mixed Conifer Zone- Low site index [less than 90]

Length of stream	1000	900	800	700	600	500	400	300	200	100
Reach Equivalent Acres	1.61	1.45	1.29	1.13	0.97	0.81	0.64	0.48	0.32	0.16
21 Largest Trees Numbers/ reach	34	30	27	24	20	17	13	10	7	3
29 additional Trees >10"	47	42	37	33	28	23	19	14	9	5
Basal Area Baseline limit	113	102	90	79	68	57	45	34	22	11
Basal Area Upper threshold	177	160	142	124	107	89	70	53	35	18

Table 1b.3: Mixed Conifer Zone- Medium Site index [90-110]

Length of stream	1000	900	800	700	600	500	400	300	200	100
Reach Equivalent Acres	1.61	1.45	1.29	1.13	0.97	0.81	0.64	0.48	0.32	0.16
21 Largest Trees Numbers/ reach	34	30	27	24	20	17	13	10	7	3
29 additional Trees >10"	47	42	37	33	28	23	19	14	9	5
Basal Area Baseline limit	145	131	116	102	87	73	58	43	29	14
Basal Area Upper threshold	209	189	168	147	126	105	83	62	42	21

Table 1b.4: Mixed Conifer Zone- High site index [greater than 110]

Length of stream	1000	900	800	700	600	500	400	300	200	100
Reach Equivalent Acres	1.61	1.45	1.29	1.13	0.97	0.81	0.64	0.48	0.32	0.16
21 Largest Trees Numbers/ reach	34	30	27	24	20	17	13	10	7	3
29 additional Trees >10"	47	42	37	33	28	23	19	14	9	5
Basal Area Baseline limit	145	131	116	102	87	73	58	43	29	14
Basal Area Upper threshold	242	218	194	170	146	122	96	72	48	24

C. Type Np: Riparian requirement tables for type Np waters

Type Np waters used the same inner zone basal area requirements as above for the habitat zone they are in with the exception that the width of the zone is 50 feet wide, [from BFW or CMZ] and minimum tree counts per acre are the following: the 10 largest trees/acre and an additional 40 trees per acre, for a total of a minimum of 50 trees per acre. A 1,000 feet of stream reach equates to approximately 1.15 acres.

The 40 additional trees will have the same requirements as those found in the 29 additional tree requirements in the type F waters.

There will also be a 30-foot wide equipment limitation zone along all Type Np and Ns waters.

Table Ic.1: Ponderosa Pine Habitat [elevations up to 2500 feet]

Length of stream	1000	900	800	700	600	500	400	300	200	100
Reach Equivalent Acre	1.15	1.04	0.92	0.81	0.69	0.58	0.46	0.35	0.23	0.12
10 Largest Trees Numbers/ reach	12	10	9	8	7	6	5	4	2	1
40 additional Trees >10"	46	42	37	32	28	23	18	14	9	5
Basal Area Baseline limit	69	62	55	49	41	35	28	21	14	7
Basal Area Upper threshold	127	114	101	89	76	64	51	39	25	13

Table Ic.2: Mixed Conifer Zone- Low site index [less than 90]

Length of stream	1000	900	800	700	600	500	400	300	200	100
Reach Equivalent Acre	1.15	1.04	0.92	0.81	0.69	0.58	0.46	0.35	0.23	0.12
10 Largest Trees Numbers/ reach	12	10	9	8	7	6	5	4	2	1
40 additional Trees >10"	46	42	37	32	28	23	18	14	9	5
Basal Area Baseline limit	81	73	64	57	48	41	32	25	16	8
Basal Area Upper threshold	127	114	101	89	76	64	51	39	25	13

Table Ic.3: Mixed Conifer Zone- Medium Site index [90-110]

Length of stream	1000	900	800	700	600	500	400	300	200	100
Reach Equivalent Acre	1.15	1.04	0.92	0.81	0.69	0.58	0.46	0.35	0.23	0.1
10 Largest Trees Numbers/ reach	12	10	9	8	7	6	5	4	2	1
40 additional Trees >10"	46	42	37	32	28	23	18	14	9	4
Basal Area Baseline limit	104	94	83	73	62	52	41	32	21	11
Basal Area Upper threshold	150	135	120	105	90	75	60	46	30	16

Table 1c.4 Mixed Conifer Zone- High site index [greater than 110]

Length of stream	1000	900	800	700	600	500	400	300	200	100
Reach Equivalent Acre	1.15	1.04	0.92	0.81	0.69	0.58	0.46	0.35	0.23	0.1
10 Largest Trees Numbers/ reach	12	10	9	8	7	6	5	4	2	1
40 additional Trees >10"	46	42	37	32	28	23	18	14	9	4
Basal Area Baseline limit	104	94	83	73	62	52	41	32	21	11
Basal Area Upper threshold	173	156	138	122	104	87	69	53	35	18